

us in looking for important revelations in other descendants of annelid-like forms. Taking the embryo as our main guide in determining questions of primitive number and arrangement, we find the possible hypotheses on the Malpighian vessels to be quite limited; since *in no insect embryo have more than three pairs of these vessels been found.*

Gegenbaur\* observed the frequent recurrence of the number two (some times expressed only in the common openings of numerous vessels) throughout all the divisions of the Arthropoda. Hence this number, he concludes, may be regarded as primitive. It is obvious that this statement may be correct for the Arthropoda in general and still in no wise conflict with the view that the ancestor of a particular subgroup may have had more than two Malpighian vessels. Thus Protentomon may have had several pairs and these, if ascertainable, might be regarded as constituting the typical number for the Hexapoda. The remote ancestor of Protentomon may have had but a single pair.

Two views have been advanced as to the number of Malpighian vessels in

\* I. c. p. 292.

BRIEF NOTES.—Thorell has just published a second octavo volume of about 500 pp. on the spiders of Indo-Malesia. It is devoted to the lower groups, and closes with a table of the geographical distribution of the 462 spiders so far known from that region.

Our students of Neuroptera will be grateful to Nathan Banks for his Synopsis, catalogue and bibliography of the neuropteroid insects of temperate North America just

primitive insects. Paul Mayer,\* in his well known treatise, expressed himself very clearly on this subject. After doing full justice to all the facts at his disposal he concludes: "Dass die anzahl der paare bei Protentomon 2 betrug, ist so gut wie sicher." The embryological evidence accumulated in 1876 was perhaps too meagre to lead to any other conclusion.

In two recent papers Cholodkowsky† advances the opinion that the primitive number of Malpighian vessels in insects is two. He bases his conclusions on some very interesting observations, to which I shall have occasion to revert, when I come to consider the Lepidoptera.

My own observations on the embryos and larvæ of several insects, together with the facts recorded by other observers, lead me to the conclusion that the ancestral number of Malpighian vessels in insects was six. In other words, Protentomon was not only hexapodous but also hexanephric.

\* Ueber ontogenie und phylogenie der insekten. Jen. zeitschr. nat. wiss. 10 bd. 1876, p. 142.

† Sur les vaisseaux de Malpighi chez les lepidopteres. Compt. rendus. tome 98, p. 631-633, 1884. Sur la morphologie de l'appareil urinaire des lepidopteres. Arch. biol. tome 6, fasc. iii, 1887.

issued in the transactions of the American entomological society. The tables are very simple and brief, perhaps erring in this latter feature.

Interesting recent papers on relationships among butterflies will be found in Spuler's Zur stammgeschichte der Papilioniden (Zool. jahrb., vi, 34 pp., 2 pl.), and Haase's Entwurf eines natürlichen systems der Papilioniden (Bibl. zool., heft. viii, 120 pp., 8 pl.).